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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/057,081	01/25/2002	Aaron Fiala	FGT 1622 PA	5142

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08/27/2003

EXAMINER

CULBERT, ROBERTS P

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 08/27/2003

8

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/057,081

Applicant(s)

FIALA ET AL.

Examiner

Roberts Culbert

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 August 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 8-55 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8-55 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- ☐ Interview Summary (PTO-413) Paper No(s) _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION***Response to Arguments***

Applicant's arguments filed 8/1/03 have been fully considered but they are not persuasive as recited below.

Applicant has argued that the combination of references does not disclose or suggest all of the limitations of independent claims 8, 16, and 25 (Page 15 of Remarks). Specifically, applicant has stated that Tate does not teach the addition of a wear resistant coating, but instead a nitride hardening treatment. However, a nitride hardening treatment deposits a wear-resistant coating on the substrate surface as is well known to one of ordinary skill in the chemical arts. Applicant has stated that a nitride hardening treatment is not the equivalent of a wear resistant coating applied to an outer surface (Page 13-14 of Remarks). The examiner respectfully disagrees with this assertion. A nitride treatment forms a layer of an entirely different material (e.g. nitride) on the surface of the substrate (e.g. aluminum) in the form of a wear-resistant coating. Tate also clearly states that the coating improves abrasion resistance. Abrasion resistance is interpreted by the office to be the same as wear-resistance as the term is applied in reference to the flowing surface of spray application equipment as in the claims. The aluminum rotary atomizing head in Tate is the same as the aluminum bell cup of the claimed invention as one of ordinary skill in the art appreciates.

Applicant has argued that Garg does not teach application of the wear resistant coating *directly* to the surface of the aluminum bell cup (Page 15-16 of Remarks). Claim 8 does not say that the coating is applied *directly* to the surface. However even if the applicant's interpretation of the application is used, the interlayer may be considered part of a wear-resistant coating formed by the two layers directly on the surface, as this step is broadly claimed by applicant. Further, the step of preparing the outer surface reads on the application of an adhesion-promoting layer, as this step is broadly claimed by applicant. Further, the prior art as recited in the background of Garg (Col. 1, Lines 13-30) and other references, clearly implies that the wear-resistant coatings have been applied in the prior art directly to the substrate without an adhesion-promoting layer. Otherwise how could the determination that poor adhesion occurs

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be made? Therefore application of the layer directly is an inherent teaching of the prior art. Although the prior art teaches that it is preferable to use the adhesion promoter, this preference falls far short of the kind of teaching that would discourage one of skill in the art from fabricating a coating without an adhesion -promoting layer.

Applicant has argued that Mahoney and Kohler are non-analogous art. The argument is not persuasive because Mahoney and Kohler are concerned with forming silicon-doped carbon coatings, and are cited only to show the art -recognized equivalence of silane and tetramethylsilane as a feed gas when forming a silicon-doped carbon coating.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

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Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8-21, 23, 25-31, 33, and 35-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,902,535 to Garg in view of Japanese Patent No. 361035868 A to Tate, U.S. Patent 5,458,927 to Malaczynski and U.S Patent 5,783,261 to Potter.

Garg teaches the formation of hard silicon-doped carbon coatings on titanium substrates with a noble metal interlayer. Refer to Abstract and Example No. 19. Garg teaches the cleaning of the substrate using argon gas (Col. 15, Lines 25-29). Garg also shows the formation of hard carbon-silicon coatings on titanium substrates using silane and methane gas (Col. 15, Lines 28-31). Garg does not teach preparation of the surface for treatment by cleaning with soap and water or solvent. Garg does not teach the application of hard-carbon coatings to aluminum surfaces or to bell cups.

Malaczynski shows that a hard-carbon coating may also be applied to an aluminum work piece to provide a scuff and wear resistant surface. See Background of Invention. Japanese Patent No. 361035868 A to Tate teaches that it is known to treat the aluminum surface of a rotary bell-cup in order to improve abrasion resistance. Potter teaches that a hard carbon coating may be applied to a metal alloy injector to improve wear resistance

It would have been obvious to one of ordinary skill in the art at the time of invention to use the carbon coating titanium treatment method of Garg to aluminum or titanium bell cups in order to improve wear-resistance as suggested by Potter, Malaczynski and Tate.

Official Notice is taken that the steps of cleaning or degreasing a metallic surface as well as the steps of removing the native oxide layers typically formed thereon are notoriously old and well known in the art of forming coatings on metals. Evidence that the steps are known in the art is provided in U.S.

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Patent 5,783,261 to Potter, and U.S. Patent 5,458,927 to Malaczynski. Potter shows the use of soap, water, nitric acid, and alcohol for degreasing a metal surface prior to application of a hard carbon coating (Col. 3, Lines 60-65). Malaczynski shows the use of argon bombardment to remove the native oxide layer from an aluminum surface prior to application of a silicon carbide layer (Col. 2, Lines 23-34)

It would have been obvious to one of ordinary skill in the art at the time of invention to prepare the surface by cleaning with soap and water or with an appropriate solvent such as acetone, alcohol, water, or to remove the native oxide layer with argon gas in the well-known manner.

Official Notice is taken that the steps of rinsing and drying are old and well known in the art for the purpose of preparing a metal surface. It would have been obvious to one of ordinary skill in the art at the time of invention to use the common preparation steps in order to provide a coating that is adherent, uniform and free from contamination.

Official Notice is taken that the limitation of using ultrasonic agitation is known in the art for the purpose of cleaning a metallic work piece. It would have been obvious to one of ordinary skill in the art at the time of invention to use ultrasonic agitation in order to improve surface cleaning in the well-known manner.

Regarding claims 41, 42, 46, 47, 51, and 52, Potter teaches that it is known in the art to form amorphous carbon coatings doped with silicon, titanium or tungsten (Col. 4, Lines 30-50). It would have been obvious to one of ordinary skill in the art at the time of invention to use any of the known dopants in order to benefit from low friction, and increased durability as suggested by Potter.

Claims 24 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,902,535 to Garg et al in view of Japanese Patent No. 361035868 A to Tate et al, U.S. Patent 5,458,927 to Malaczynski, U.S. Patent 5,783,261 to Potter, U.S. Patent 5,286,534 to Kohler and U.S. Patent 6,086,962 to Mahoney.

As applied above, Garg in view of Tate, Malaczynski, and Potter discloses the method of the invention substantially as claimed, but does not show the use of tetramethylsilane (TMS) or diethylsilane (DES) as a source gas.

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Kohler teaches a method for depositing hard carbon coatings that includes a feed gas with a carbon source such as methane and acetylene (Col. 6, Line 52) and a silicon containing hydrocarbons such as tetramethylsilane (Col. 6, Line 58).

Mahoney teaches that hard silicon-doped carbon coatings may be formed using hydrocarbon compounds such as methane and butane and silicon-containing compounds such as tetramethylsilane or diethylsilane (Col. 8, line 61- Col. 9, lines).

Potter further teaches that hard silicon-doped carbon coatings may be formed using a carbon precursor gas such as methane or acetylene (Col. 4, Line 21) and a second gas containing tetramethylsilane or diethylsilane (Col. 4, Lines 30-31).

It would have been obvious to one of ordinary skill in the art at the time of invention to use the feed gas including methane or acetylene or butane, and a second gas such as tetramethylsilane or diethylsilane as these source gasses are shown to be art-recognized equivalents for the purpose of forming a silicon-doped carbon coating as shown in the Mahoney Potter, and Kohler references.

Claims 22 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,902,535 to Garg et al in view of Japanese Patent No. 361035868 A to Tate et al, U.S. Patent 5,458,927 to Malaczynski, U.S Patent 5,783,261 to Potter, and U.S. Patent 4,919,773 to Naik.

As applied above, Garg in view of Tate, Malazynski and Potter disclose the method of the invention substantially as claimed, but do not teach the use of chromium as the interlayer noble metal.

Since Garg teaches the use of a noble metal interlayer, selection of chromium for this layer is obvious since Garg teaches that "noble metal" means only a non reactive metal (Col. 6, Lines 26-30). However, Naik teaches that chromium or a noble metal may be used as an interlayer between an erosion resistant carbon layer and a titanium substrate. See Abstract and (Col. 3, Lines 48-51).

It would have been obvious to one of ordinary skill in the art at the time of invention to form the interlayer using chromium in order to provide a first layer capable of retaining substrate integrity and preventing diffusion from the second layer into the substrate as taught by Naik.

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Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (703) 305-7965. The examiner can normally be reached on Monday-Friday (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

R. Culbert




GREGORY MILLS
SUPERVISORY PATENT EXAMINER
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